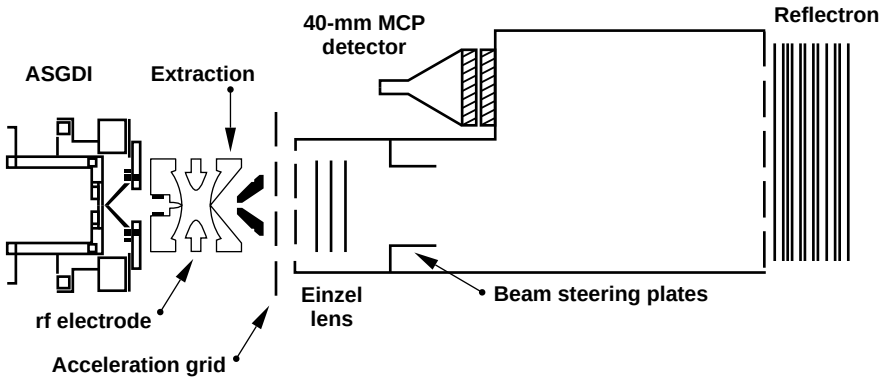
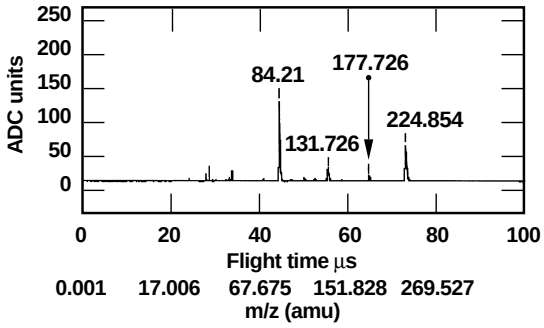
Direct Monitoring of Airborne Compounds

Ion trap/time-of-flight mass spectrometry provides high sensitivity, real-time analysis

LLNL has developed a novel, mass analyzer hybrid for high-sensitivity (low parts-per-trillion), real-time analysis (10–100 milli-seconds/spectrum) of volatile compounds in air. This unique instrument provides selective, specific chemical information on a wide range of compounds. Air is drawn directly into the mass spectrometer and analyzed. No sample preparation is required—which is ideal for automated field-monitoring applications.



Time-of-flight instrument



Full mass scan of tributyl phosphate in air,100-ms analysis.

APPLICATIONS

- *Fast detection for gas chromatography*
- *Hazards and chemical spill identification*
- *Industrial-stack and effluent monitoring of volatile compounds*
- *Environmental surveys*
- *Concealed-contraband detection*

Operational approach

The instrument can be divided into three regions: an ionization source, an ion storage trap, and a time-of-flight mass spectrometer (TOF-MS). Air is directly sampled in the first region and ionized by an atmospheric sampling glow discharge ionization (ASGDI) source. The ASGDI source has a high ionization efficiency, comparable to atmospheric pressure ionization , and provides a more direct means of ion transport into the mass analyzer chamber. The ion storage trap interfaces with the ASGDI source and the TOF-MS by converting the continuum ion beam from the source into the discrete pulses required for the TOF-MS. In addition, the ion trap can be operated in different modes—including ion accumulation and selectiveion storage—to increase analyte sensitivity. TOF-MS analysis provides high transmission efficiency (nominally 50%) and fast analysis times (submilliseconds/scan).

Availability: The technology is available now. We are currently developing a high-performance, prototype field instrument and new approaches to data compression. We seek industrial partners with whom we can develop the instrument for specific applications.

Contacts

Brian D. Andresen or David M. Chambers
Phone: (510) 423-1189
Fax: (510) 423-9014
E-mail: andresen1@llnl.gov
Mail code: L-371